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Feature Article

Aircraft Improvements Lead To Dilemma of 'Concurrency'

by Sandra I. Erwin

One of the most vexing problems in simulation-based military flight trainers today is their failure to keep up with the technological upgrades made to the "real" aircraft, industry and government officials said.

Such disparity between the configurations of aircraft and trainers is "a major challenge," said Navy Capt. Rory H. Fisher, program manager for aviation training at the Naval Air Systems Command.

During a recent interview, Fisher explained that tactical aircraft are equipped with what is known as an "operational flight program." As modifications are made to the aircraft that affect the mission computer, the operational flight program also changes. But while changes in the aircraft typically are funded in the program's budget, that is not the case with the simulators. "That is one of those things that are 'free in the aircraft' but not in the simulator," said Fisher. "You have to pay for the upgrades.

"You may need to re-host your computers or upgrade your visual systems or upgrade your target projectors in order to get new capabilities in the trainers," he said. A simple engineering update, for example, may cost $500,000 to incorporate into 50 aircraft, but it may cost $5 million to put that engineering change in a simulator. "Is that cost-effective? You have to figure that out."

Cost-versus-capability tradeoffs in the Navy "are made all the time," said Fisher. "When you are limited in funding, you have to make tough decisions."

The Navy, meanwhile, is counting on breakthroughs in technology to achieve lower-cost simulators, such as PC-based systems, which "could fill some of the void," Fisher said. "But the fleet guys don't want to hear that." The typical reaction of a Navy pilot, he said, is, "I didn't join the Navy to play a video

game. I joined the Navy to fly an airplane."

The lack of concurrency between the aircraft and the simulators is an issue "the military struggles with," said John Lenyo, vice president for business development at BAE Systems Flight Simulation and Training, in Tampa, Fla.

"They do not usually upgrade the simulators at the same time the platform is upgraded," he said in an interview. The reason is that each side relies on "different kinds of money." The money used to upgrade airplanes comes from a different account than the funds used for training. "They are trying to address this problem with new platforms, such as Joint Strike Fighter or the V-22 Osprey, where they are buying the trainer through the prime contractor," said Lenyo.

BAE has been working on solving the concurrency problem in the C-130 J Hercules cargo aircraft trainer. The airplane is built by Lockheed Martin Corporation. "Because they are the aircraft prime, they have access to the aircraft data and they provide the data to us so that we can deliver a concurrent simulator," said Lenyo.

To keep the simulator current, he said, BAE relies on a technique known as stimulation. "We actually stimulate the aircraft's computers, avionics, black boxes to think that they are flying when they are in the simulator." The prime contractor controls the software in the airplane, Lenyo explained. "We load the operational flight programs into the simulator. Whenever Lockheed makes a change to the aircraft, we can make a very rapid change to the simulator."

The "stimulation" of the avionics, black boxes and computers means they are receiving the same signals that they would get in the airplane, while flying, he added. "They are fooled into thinking that they are at 20,000 feet over England, instead of bolted to the floor in Tampa. ... It exactly matches the airplane."

The Navy's new F/A-18E/F Super Hornet flight trainers get around the concurrency problem, because they are "software upgradable," said Gary Nesta, vice president for training devices at L-3 Communications Link Simulation and Training division, in Arlington, Texas. "We are not dependent on any aircraft component for these simulators," Nesta said in an interview. The company was awarded a contract by the F/A-18 manufacturer, The Boeing Company, to build the trainers.

"In the past, we used onboard avionics boxes, which are not cost effective," he said. "They require special power, cooling. [In partnership with Boeing], we developed a mission computer emulator so we can run the emulated avionics code with a general purpose computer." The upshot is that "we don't need the aircraft boxes any more," Nesta said. "For the displays, we have made simulated displays. It's a simulated COTS-based aircraft environment. We can make operational flight training programs that get upgraded and installed more easily."

If the capabilities of the aircraft are different from the capabilities of the trainer, Fisher said, the trainer becomes “tactically irrelevant.” That is an important consideration, he said, when it comes to networking simulators. “If we are not going to commit the funding to keep our simulators in the same configuration as the aircraft, there is no reason to network them because they won’t be interoperable and they won’t have tactical relevance.”